

**REMARKS**

This Amendment is responsive to the Office Action mailed on March 3, 2005. Claims 47-92 are pending in this application. Claims 47, 49, 56-58, and 82-84 are amended herein.

Claims 51-55, 59-79 and 86-92 are withdrawn from consideration. The Examiner has indicated that claims 47-49 and 80-85 are generic. It is Applicants' understanding that upon the allowance of a generic claim, Applicants will be entitled to consideration of claims to additional species which are written in dependent or otherwise include all the limitations of a generic claim.

The Examiner has indicated that claims 82-84 would be allowable if rewritten to overcome the rejection(s) under 35 U.S.C. 112, 2<sup>nd</sup> paragraph and to include all of the limitations of the base claim and any intervening claims.

The Examiner has rejected claims 47-50, 56-58 and 80-85 under 35 U.S.C. §112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as his invention. The claims are amended herein to overcome the 35 U.S.C. § 112 rejection, withdrawal of which is respectfully requested.

The Examiner has rejected claims 47, 50, 56-58, 80 and 81 under 35 U.S.C. §102(e), as being anticipated by or, in the alternative, under 35 U.S.C §103(a) as being obvious over US 6,627,035 (hereinafter Fan).

The Examiner has rejected claims 47-49 under 35 U.S.C. §102(e), as being anticipated by or, in the alternative, under 35 U.S.C §103(a) as being obvious over SU 1694411 (hereinafter Bogomolov).

The Examiner has rejected claims 47, 48, 50 and 56-58 under 35 U.S.C. §103(a) as being unpatentable over US 4,992,126 (hereinafter Door) in view of US 4,603,060 (hereinafter Mitsuda).

These rejections are respectfully traversed in view of the amended claims and the following comments.

#### **Discussion of Amended Claims**

Claims 47, 49, 56-58, and 82-84 are amended herein in order to overcome the 35 U.S.C. § 112 rejections and to more clearly define the present invention.

#### **Brief Discussion of the Present Invention**

In accordance with the present invention, a rolling process and a spraying process are combined to produce a multi-layer electrode or electrode assembly. With such a process, the use of semi-finished products during the production of a multi-layer electrode or electrode assembly can be dispensed with. The structure which corresponds to a semi-finished product of the prior art is itself produced during the inventive process (See, e.g., Applicants' specification, paragraph bridging pages 1-2).

By combining the processes of rolling material and spraying material, the advantages of these respective processes can be utilized and the individual layers which have been rolled or sprayed on separately from one another can then be combined (See, e.g., Applicants' specification, page 2, first full paragraph).

It is known, for example, from the state of the art to form a carrier structure by means of a carbon fabric or a carbon fleece (see e.g., Fan at col. 5, line 10). Materials of this type are relatively expensive. With the present invention, a carrier structure may be formed by rolling carbon particles on a carrier

which is considerably less-expensive than a carbon fabric or carbon fleece. In particular, the carrier may be a carrier tape or carrier mesh (See, e.g., Applicants' specification, page 2, second full paragraph).

With the present invention, the functional properties of the multi-layer electrode or electrode assembly may be selectively adjusted as a result of a function layer. Examples of functional layers are barrier layers, reaction layers, contact layers and the like (See, e.g., Applicants' specification, page 2, third full paragraph).

The prior art of record does not disclose or remotely suggest Applicants' claimed invention.

#### **Discussion of Fan**

Claims 47, 50, 56-58, 80 and 81 stand rejected as being anticipated by Fan. This rejection is respectfully traversed. An anticipation rejection requires that each and every element of the claimed invention as set forth in the claim be provided in the cited reference. See *Akamai Technologies Inc. v. Cable & Wireless Internet Services Inc.*, 68 USPQ2d 1186 (CA FC 2003), and cases cited therein. As discussed in detail below, Fan does not meet the requirements for an anticipation rejection.

Fan discloses producing a gas diffusion electrode by mixing a slurry comprising carbon black, at least one alcohol and water with a tetrafluoroethylene emulsion to form a slurry which, in turn, is applied to a carbon cloth substrate to form a coated carbon cloth (Col. 5, Lines 7-12). The carbon black slurry is applied to the carbon cloth substrate by tape casting. The coated carbon cloth is then heated to a temperature suitable for driving off water and producing a substantially dry carbon cloth. The coated carbon cloth is then rolled to substantially eliminate

cracks. Wetting agents released from the tetrafluoroethylene emulsion help smooth the cracks during the rolling. The rolled carbon cloth is then heated again in order to remove the wetting agents released from the tetrafluoroethylene emulsion during the rolling. The cloth is then allowed to cool and is rolled again to provide the finished product (Col. 5, lines 18-31). A catalyst may then be applied to the surface of the gas diffusion electrode by a spray method (Col. 7, lines 60-63).

The Examiner has rejected claims 47, 50, 56-58, 80 and 81, stating that Fan discloses at column 5 "applying a slurry comprising carbon black to a carbon cloth and passing the dried coated carbon cloth through rollers for rolling" (Office Action, page 5). Applicants respectfully submit that the Examiner has misinterpreted the disclosure of Fan.

The process of Fan is in contrast with the process of Applicants' claimed invention. As set forth in Applicants' amended claim 47, Applicants' first layer is rolled onto a carrier. In contrast, in Fan, the carbon black slurry is applied to the carbon cloth substrate by tape casting (also known as doctor blading and knife coating) in order to produce the coated carbon cloth. Tape casting utilizes a scraping blade, known as the "doctor" for removing excess substances from a moving surface being coated. In Fan, once the slurry is applied to the carbon cloth by tape casting, the coated carbon cloth is then heated and dried. Only after the coated carbon cloth of Fan is dried is it rolled to eliminate cracks (Fan, Col. 5, lines 12-23). The process of rolling the already coated and dried carbon cloth is a step in finishing an already produced layer, and is not equivalent to Applicants' claimed rolling of a first layer onto a carrier.

Applicants' process provides a significant advantage in avoiding the use of an expensive carbon cloth substrate by

applying the first layer to the carrier by rolling the first layer onto the carrier. Applicants' process also provides the advantage of replacing the multiple steps disclosed in Fan (mixing a slurry, coating a carbon cloth in the slurry, heating and driving off water, rolling to eliminate cracks, and heating to remove wetting agents, cooling, and rolling again) with basically a single step of rolling a first layer onto a carrier. With Applicants' claimed invention, there is no need for post-processing the applied layer to remove cracks, since cracks will be avoided by the rolling process used to apply the first layer.

There is simply no disclosure or suggestion in Fan of rolling a first layer onto a carrier as claimed by Applicants. In Fan, the slurry has already been applied to the carbon cloth by tape casting, and the resulting coated carbon cloth has already been heated to remove water, before the cloth is rolled. Accordingly, in Fan, the rolling is performed to remove cracks from an already applied first layer.

As Fan does not disclose each and every element of the invention as claimed, the rejections under 35 U.S.C. § 102(e) are believed to be improper, and withdrawal of the rejections is respectfully requested. See, *Akamai Technologies Inc., supra*.

In the alternative, the Examiner has rejected claims 47, 50, 56-58, 80 and 81 as being obvious in view of Fan.

As discussed above, Fan does not disclose or remotely suggest rolling of a first layer onto a carrier. The first rolling step in Fan is used to remove cracks from the already coated carbon cloth. In Fan, the wetting agent present in the slurry which has already been applied to the carbon cloth help smooth the cracks from the coating layer during the first rolling step. A second rolling step in fan is used as a final finishing step (Fan, Col. 5, lines 5-32).

Further, as discussed above, in Fan, the carbon slurry is applied to the carbon cloth by tape casting. The process of applying a layer by tape casting as disclosed in Fan is far removed from Applicants' claimed process of rolling a first layer onto the carrier. In tape casting, a scraping blade is used to remove excess substance from a moving surface being coated. Tape casting is described in U.S. patent no. 2,582,993 to Howatt.

There is no disclosure or suggestion of rolling a layer onto a substrate in Fan.

Only with hindsight gained impermissibly from Applicants' disclosure could one of ordinary skill in the art arrive at the conclusions reached by the Examiner.

Withdrawal of the rejections under 35 U.S.C. § 103(a) is therefore respectfully requested.

Applicants respectfully submit that the present invention is not anticipated by and would not have been obvious to one skilled in the art in view of Fan, taken alone or in combination with any of the other prior art of record.

#### **Discussion of Bogomolov**

Claims 47-49 stand rejected as being anticipated by Bogomolov. This rejection is respectfully traversed. An anticipation rejection requires that each and every element of the claimed invention as set forth in the claim be provided in the cited reference. See *Akamai, supra*. As discussed in detail below, Bogomolov does not meet the requirements for an anticipation rejection.

Applicants attach hereto an English language translation of Bogomolov. References to the specification of Bogomolov in the discussion below are references to the English language translation attached hereto.

The Examiner has rejected claims 47-49, stating that the Bogomolov discloses "using rollers 4 and heater 14 to apply polymer coating (first layer) to a first strip electrode (carrier); and using a sprayer to apply piezoceramic powder (additional function layer) to the coating" (Office Action, page 5).

Applicants respectfully submit that the Examiner has misinterpreted Bogomolov. In Bogomolov, the electrodes 3, 8, and 10 are part of the manufacturing facility that produces composite material strips of film. These electrodes are not part of the film that is manufactured, as is apparently assumed by the Examiner. Rather, the electrodes are used to polarize the polymer used to make the film during the film production process.

In contrast, Applicants' claimed process is a process for the production of a multi-layer electrode or electrode assembly wherein a first layer is rolled onto a carrier. The end result of Applicants' process is a multi-layer electrode or electrode assembly. In contrast, the strip electrode disclosed in Bogomolov is a tool used in the process of making the composite film strips. Accordingly, the electrode of Bogomolov is not equivalent to a carrier of an electrode as claimed in Applicants' claim 47, as the electrodes in Bogomolov do not become part of the finished product. Therefore, the rolling of a molten polymer onto a strip electrode in Bogomolov is not equivalent to Applicants' claimed rolling of a first layer onto a carrier.

Further, with Bogomolov, the filler material that is sprayed onto the polymer film is not equivalent to Applicants' claimed function layer which is sprayed on after the first layer is rolled onto the carrier. In contrast, in Bogomolov, the filler is impressed deeply into the molten polymer film when the particles of the filler are reflected from the positively charged 1000v electrode 8 (Bogomolov, page 2, lines 14-20). Accordingly, the

spraying of the filler is mixed in with the polymer and does not result in an additional layer, as claimed by Applicants.

Bogomolov is not related to a process for producing a multi-layer electrode or electrode assembly. Rather, Bogomolov is directed towards the manufacture of composite material films, which is not equivalent to Applicants' claimed process for producing a multi-layer electrode or electrode assembly. In Bogomolov, the purpose of the electrode is to facilitate the polarization of the molten polymer during the process. In Bogomolov, the final product of the process is a composite film material which does not function as (or even include) a multi-layer electrode or electrode assembly as claimed in Applicants' claim 47.

Accordingly, the process disclosed in Bogomolov for producing a composite film material is far removed from Applicants' claimed process used for the production of a multi-layer electrode or electrode assembly.

As Bogomolov does not disclose each and every element of the invention as claimed, the rejections under 35 U.S.C. § 102(e) are believed to be improper, and withdrawal of the rejections is respectfully requested. See, *Akamai Technologies Inc., supra*.

In the alternative, the Examiner has rejected claims 47-49 as being obvious in view of Bogomolov.

As discussed above, Bogomolov is not directed at producing a multi-layer electrode or electrode assembly as claimed by Applicants. Rather, the process of Bogomolov uses electrodes in producing a polarized composite film assembly.

Furthermore, the process for producing a multi-layer electrode or electrode assembly as claimed by Applicants and the process for producing a composite film as disclosed in Bogomolov are not analogous art. In order to be considered prior art for the purposes of an obviousness rejection, the referenced art must



be analogous. Art is only analogous if "the art is from the same field of endeavor, regardless of the problem addressed," *In re Deminski*, 796 F.2d 436, 230 USPQ 313, 315 (Fed. Cir. 1986) or "reasonably pertinent to the particular problem with which the inventor was involved." *Wood*, 599 F.2d at 1036, 202 USPQ at 174. Applicant respectfully submits that composite film art is not in the same field of endeavor as multi-layer electrode art.

Applicants further submit that there is no motivation for one skilled in the art to look to composite material film art when attempting to overcome problems associated with applying a first layer to a carrier in the production of a multi-layer electrode or electrode assembly, which problems are solved by Applicants' claimed invention.

Only with hindsight gained impermissibly from Applicants' disclosure could one of ordinary skill in the art arrive at the conclusions reached by the Examiner.

Withdrawal of the rejections under 35 U.S.C. § 103(a) is therefore respectfully requested.

Applicants respectfully submit that the present invention is not anticipated by and would not have been obvious to one skilled in the art in view of Bogomolov, taken alone or in combination with any of the other prior art of record.

#### **Discussion of Door and Mitsuda**

Claims 47, 48, 50 and 56-58 stand rejected as being obvious over Door in view of Mitsuda. This rejection is respectfully traversed. As discussed in detail below, the combination of Door and Mitsuda do not meet the requirements for an obviousness rejection.

Door discloses a method for making an ion permeable membrane, electrode, and current collector assembly. Door

discloses applying catalytic particles to the binder-coated foundation layer by spraying. (Column 5, lines 19-28). A fluoropolymer is bonded onto the surface of the catalytic particle coated foundation layer for finishing the membrane. (Column 5, lines 50-51).

In contrast to Door, the process of Applicants' claimed invention is much simpler, since the multi-layer electrode or electrode assembly is manufactured by building up of subsequent layers on a carrier. With Applicants' claimed process, a first layer is rolled onto the carrier, and at least one additional layer is sprayed on after the first layer is rolled onto the carrier. Accordingly, there is no bonding required with Applicants' claimed process as there is in Door.

As set forth in Applicants' amended claim 47, at least one additional layer, which is a function layer, is produced by spraying on a powder. In contrast, the step of applying catalytic particles to the binder coated foundation layer by spraying is only a part of producing a function layer in Door. The process for producing the final catalytic layer includes the steps of bonding a fluoropolymer onto the surface of the catalytic particle coated foundation layer. Further, heat and/or pressure must be added after bonding of the fluoropolymer in order to achieve a continuous sheet (Col. 5, lines 57-60). Accordingly, the spraying step in Door does not produce a function layer. Door does not disclose or remotely suggest producing a function layer by simply spraying a on powder, as claimed by Applicants.

The Examiner has acknowledged that Door does not disclose applying a layer to the carbon cloth by rolling. The Examiner indicates that Mitsuda discloses "in manufacturing an electrode, a reverse roll coating method is advantageous." (Office Action, page 6).

Mitsuda discloses a method of manufacturing an electrode for a fuel cell. The cited portion of Mitsuda, Column 2, lines 12-15, relied on by the Examiner does indicate that the use of a reverse roll coating method is advantageous. Matsuda combines the rolling with a doctor roller 13 which restricts the flow of paste onto roller 14. There is no disclosure or suggestion in Matsuda of providing an additional layer by spraying on of a powder after a first layer is rolled onto the carrier.

Further, Mitsuda teaches away from a spraying method at Column 1, lines 53-57 stating that the "spraying method has the disadvantage that many steps are required and a large amount of paste is wasted and accordingly it is difficult to carry out a large-scale production and therefore not economical."

Therefore, both Door and Mitsuda fail to disclose the process of producing a function layer by spraying a powder. Furthermore, Door and Matsuda in combination fail to disclose or suggest both producing a first layer by rolling and producing an additional, function layer, by spraying on of a powder. Door does not disclose a rolling process and Mitsuda teaches away from a spraying process for applying layers.

Further, there is no motivation for one skilled in the art to combine Door with Matsuda, since Matsuda teaches away from the spraying process used by Door.

Only with hindsight gained impermissibly from Applicants' disclosure could one of ordinary skill in the art arrive at the conclusions reached by the Examiner from the disclosures of Door and Matsuda.

Withdrawal of the rejections under 35 U.S.C. § 103(a) is therefore respectfully requested.

Applicants respectfully submit that the present invention would not have been obvious to one skilled in the art in view of

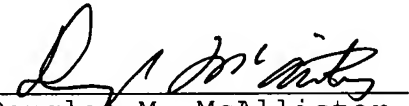
the combination of Door and Mitsuda, or any of the other prior art of record.

Further remarks regarding the asserted relationship between Applicants' claims and the prior art are not deemed necessary, in view of the amended claims and the foregoing discussion. Applicants' silence as to any of the Examiner's comments is not indicative of acquiescence to the stated grounds of rejection.

**Conclusion**

The Examiner is respectfully requested to reconsider this application, allow each of the pending claims and to pass this application on to an early issue. If there are any remaining issues that need to be addressed in order to place this application into condition for allowance, the Examiner is requested to telephone Applicants' undersigned attorney.

Respectfully submitted,

  
Douglas M. McAllister  
Attorney for Applicant(s)  
Registration No. 37,886  
Lipsitz & McAllister, LLC  
755 Main Street  
Monroe, CT 06468  
(203) 459-0200

**ATTORNEY DOCKET NO.:HOE-680**

Date: May 27, 2005